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(54) **ASSEMBLIES, SYSTEMS AND METHODS FOR BALANCED SUSPENSION OF LUMINAIRES**
ANORDNUNGEN, SYSTEME UND VERFAHREN ZUR BALANCIERTEN AUFHÄNGUNG VON
LEUCHTEN
ENSEMBLES, SYSTÈMES ET PROCÉDÉS DE SUSPENSION ÉQUILBRÉE DE LUMINAIRES

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Description

Technical Field

[0001] This invention relates to assemblies, systems and methods for balanced suspension of luminaires.

Background

[0002] When suspending luminaires, it is sometimes necessary to have suspension cables arranged in adjacent pairs. This may be for aesthetic reasons, or may be due to the necessity to achieve a certain number of conductors with powered suspension cables.

[0003] Ideally, tension in all of the suspension cables should be even. However, because of granularity in the cable length adjustment mechanisms typically used in suspended luminaires, it is nearly impossible to achieve balanced cable tension in adjacent pairs using these mechanisms alone.

[0004] As suspension cable diameter increases, the increment of length adjustment will also typically increase. For powered suspension cable applications, relatively thick cables are required to reduce electrical resistance. These thick cables lead to coarser increments of length adjustment.

[0005] The result of the inability to make fine adjustments to cable length is that only one cable of the pair will carry the load, while the other is inevitably slack. Slack cables are detrimental to the aesthetics of the luminaire. With coarser cable length adjustment increments, the degree of slackness can quickly become unacceptable.

[0006] Evenly balancing tension between luminaire suspension cables to remove slack is desirable.

[0007] US 2017/198872 describes a luminaire mounting and suspension assembly comprising a mounting unit and a plurality of suspension units. DE 10 2014 101 729 A1 discloses a device for raising and lowering of a lighting fixture relative to a support attached to a ceiling, the device has a holding element vertically pivotable between edges, which is supported at a middle coupling point of a balance beam.

Summary

[0008] In one aspect of the invention a luminaire mounting and suspension assembly in accordance with claim 1 is provided. The assembly comprises a mounting unit and a plurality of suspension units. Each suspension unit comprises a housing coupled to the mounting unit and a yoke pivotally coupled to the housing at a pivot point, so as to be pivotable about a pivot axis. The yoke comprises a pair of cable grippers, each cable gripper positioned on opposing sides of each pivot point and configured to grip a suspension cable for suspending a luminaire, wherein the pivot axis is perpendicular to axes of the suspension cables and whereby free rotation of the yoke about the pivot axis evenly balances tension

between the suspension cables.

[0009] In some embodiments the housing comprises a pair of stops for limiting the range of rotation of the yoke about the pivot axis. In some embodiments the yoke comprises a yoke plate with opposing end portions, and each sidewall of the housing comprises a shoulder defining the stop, whereby engagement of one of the end portions with a corresponding one of the stops defines a limit of the range of rotation of the yoke. In some embodiments the range of rotation of the yoke is limited to no greater than approximately 20 degrees, or approximately 15 degrees, or approximately 10 degrees.

[0010] In some embodiments the cable grippers are fixedly coupled to the yoke plate. The cable grippers may be aligned along a plane perpendicular to the axis of the pivot axis. In some embodiments the yoke plate comprises a pair of opposing flanged yoke portions extending perpendicularly from the yoke plate, wherein the housing comprises a housing plate and a pair of opposing flanged housing portions extending perpendicularly from the housing plate, and wherein the pivot point includes pivot pin rotatably coupling the flanged yoke portions and flanged housing portions. In some embodiments the yoke is positioned on top of the housing, whereby the yoke is acted on by compression forces due to the load of the luminaire. In other embodiments the yoke is positioned below the housing, whereby the yoke is acted on by tension forces due to the load of the luminaire. The housing plate may comprise a pair of apertures through which the cable grippers and/or suspension cables extend, the apertures dimensioned to accommodate lateral movement of the cable grippers and/or suspension cables due to the free rotation of the yoke.

[0011] In some embodiments the housing is pivotally coupled to the mounting unit. In other embodiments, the housing is fixedly coupled to the mounting unit. In some embodiments the suspension units are evenly arranged about the mounting unit. In some embodiments the assembly comprises a pair of power wires, each power wire extending from the mounting unit to a respective one of the cable grippers and connecting to a respective one of the suspension cables.

[0012] In one aspect of the invention a luminaire system in accordance with claim 14 is provided. The system comprises a mounting and suspension assembly as described herein and a luminaire suspended by the assembly.

[0013] In one aspect of the invention a method of suspending a luminaire in accordance with claim 15 is provided. The method comprises providing and suspending a luminaire system as described herein; allowing the limitation of the range of motion of the yoke of each of the suspension units to support the luminaire by one of the suspension cables of each of the suspension units; adjusting length of the suspension cables with the cable grippers until any remaining length discrepancy between each pair of the suspension cables can be overcome with the range of motion of the yoke of each suspension unit;

and allowing free rotation of the yoke of each suspension unit about the pivot axis to evenly balance tension between the pairs of suspension cables in each of the yokes.

[0014] Further aspects and example embodiments are illustrated in the accompanying drawings and/or described in the following description.

Brief Description of Drawings

[0015] The accompanying drawings illustrate non-limiting example embodiments of the invention.

Figure 1 is an isometric view of a luminaire system according to an embodiment of the invention showing the suspension cables in balanced tension.

Figure 2 is an isometric view of a luminaire system according to the embodiment shown in Figure 1 showing the suspension cables in unbalanced tension.

Figure 3 is a partial side view of a luminaire mounting and suspension assembly according to an embodiment of the invention.

Figure 4 is a side view of a suspension unit of the luminaire mounting and suspension assembly according to the embodiment shown in Figure 3, shown the range of motion of the yoke.

Figure 5 is a diagram depicting unbalanced forces on the yoke of a suspension unit of the luminaire mounting and suspension assembly according to the embodiment shown in Figure 3.

Figure 6 is a diagram depicting balanced forces on the yoke of a suspension unit of the luminaire mounting and suspension assembly according to the embodiment shown in Figure 3.

Figure 7 is a diagram depicting balanced forces on the yoke of a suspension unit of a luminaire mounting and suspension assembly according to an embodiment of the invention.

Figure 8 is a partial bottom isometric view of the luminaire mounting and suspension assembly according to the embodiment shown in Figure 3.

Figure 9 is a partial top isometric view of the luminaire mounting and suspension assembly according to the embodiment shown in Figure 3.

Description of embodiments

[0016] Throughout the following description, specific details are set forth in order to provide a more thorough

understanding of the invention. However, the invention may be practiced without these particulars. In other instances, well known elements have not been shown or described in detail to avoid unnecessarily obscuring the invention. Accordingly, the specification and drawings are to be regarded in an illustrative, rather than a restrictive, sense.

[0017] This invention relates to luminaires, and in particular to assemblies, systems and methods for balanced suspension of luminaires where suspension cables are arranged in pairs. Aspects of the invention relate to providing a plurality of suspension units evenly arranged about a mounting unit. Each suspension unit includes a pair of suspension cables from which a luminaire is suspended. Tensioning between each pair of suspension cables is balanced by a yoke mechanism to remove any slack in the suspension cables.

[0018] Figures 1 and 2 show a luminaire system 10 according to an embodiment of the invention. Luminaire system 10 includes a luminaire 12 suspended by a luminaire mounting and suspension assembly 14. Assembly 14 includes a mounting unit 16 and a plurality of suspension units 18. Suspension units 18 are evenly arranged about mounting unit 16. In the illustrated embodiments three suspension units 18 are provided. In other embodiments, less or more suspension units 18 may be provided. Each suspension unit 18 includes a pair of suspension cables 28.

[0019] In Figure 1 suspension cables 28 are equally tensioned and taut whereas in Figure 2 suspension cables 28 are taut while suspension cables 28' are slack. That is, Figure 2 shows system 10 before the suspension cables are automatically balanced by the invention as described herein.

[0020] Figures 2, 3, 5, 6, 8 and 9 show assembly 14, and in particular suspension unit 18, in greater detail. Suspension unit 18 includes a housing 20 and a yoke 22. Housing 20 is coupled to mounting unit 16. In some embodiments, housing 20 may be pivotally coupled to mounting unit 16 at pivot points 48. In other embodiments, housing 20 may be fixedly coupled, or integrally formed with, mounting unit 16.

[0021] Housing 20 is pivotally coupled to yoke 22 at pivot point 24, so as to be pivotable about a pivot axis. In some embodiments, a pair of cables grippers 26 is mounted on yoke 22. In other embodiments, cable grippers 26 may be integrally formed with yoke 22. Cable grippers 26 are configured, as known in the art, to gripably engage and disengage a suspension cable extending therethrough to adjust the length of suspension cable 28 for suspending luminaire 12. Power wires 46 extend from mounting unit 16 to a respective one of cable grippers 26 and connect to a respective one of suspension cables 28 to deliver power to luminaire 12.

[0022] Cable grippers 26 are positioned on yoke 22 equidistantly on either side of pivot point 24. The axes of suspension cables 28 are perpendicular to the axis of pivot point 24. Accordingly, once the lengths of suspen-

sion cables 28 are set by cable grippers 26, free rotation of yoke 22 about pivot axis evenly balances tension between the pair of suspension cables 28.

[0023] Rotation of yoke 22 is limited to a range of rotation 50 as described herein. Housing 20 includes a pair of stops 30. In some embodiments, stops 30 are shoulders of sidewalls 36 of housing 20. Yoke 22 includes a yoke plate 32 to which cable grippers 26 are fixed. Cable grippers 26 may be aligned along a plane perpendicular to the axis of pivot point 24.

[0024] Yoke plate also has opposing end portions 34. As shown best in Figure 4, yoke plate 32 spans housing 20 such that an end portion 34 will engage a shoulder 30 at one extreme of range of rotation 50 of yoke 22, and the other end portion 34 will engage the other shoulder 30 at the other extreme of range of rotation 50 of yoke 22. Figure 4 shows rotational movement of yoke 22, indicated by arrow 52, and the resulting vertical displacement of cable grippers 26 (and therefore suspension cables 28), indicated by arrow 54. This vertical displacement defines the fine adjustment that evenly balances the tensioning between the pairs of suspension cables 28.

[0025] In some embodiments, range of rotation 50 of yoke 22 is limited to no greater than approximately 20 degrees, or approximately 15 degrees, or approximately 10 degrees.

[0026] Yoke plate 32 includes a pair of opposing flanged yoke portions 38 extending perpendicularly from the front and back of yoke plate 32. Housing 20 includes a housing plate 40 and a pair of opposing flanged housing portions 42 extending perpendicularly from the front and back of housing plate 40. Pivot point 24 includes a pin 56 rotatably coupling the flanged yoke portions 38 and flanged housing portions 42, as best shown in Figure 9.

[0027] In the illustrated embodiment, yoke 22 is positioned on top of housing 20, and the load of luminaire 12 results in compression forces acting on yoke 22 as shown in Figures 5 and 6. As shown in Figure 5, if the load is uneven (i.e., one cable 28 is taut and the other cable 28' is slack as shown in Figure 2), then yoke 22 will pivot until it reaches equilibrium with balanced loads as shown in Figure 6 (i.e., both cables 28 are taut, as shown in Figure 1).

[0028] In other embodiments, yoke 22 may be positioned below housing 20, and the load of luminaire 12 results in tension forces acting on yoke 22. If the load is uneven, yoke 22 will pivot until it reaches equilibrium as shown in Figure 7.

[0029] Regardless of whether yoke 22 is positioned above or below housing 20, the geometry of luminaire 12 and the additional suspension units 18 (and their respective suspension cables 28) ensure luminaire 12 is restricted from rotating around an axis parallel to the pivot axis. In other words, once equilibrium is achieved in each yoke 22 of assembly 14, luminaire system 10 is stable and not susceptible to oscillation.

[0030] As shown best in Figures 8 and 9, housing 20

may be pivotally coupled to mounting unit 16. In other embodiments, housing 20 may be fixedly coupled, or integrally formed with, mounting unit 16.

[0031] As shown best in Figure 8, housing plate 40 may include a pair of apertures 44 through which cable grippers 26 and/or suspension cables 28 extend. Apertures 44 are dimensioned to accommodate lateral movement of cable grippers 26 and/or suspension cables 28 as yoke 22 rotates to achieve equilibrium.

[0032] In operation, a luminaire system 10 is provided and suspended. The limitation of range of motion 50 of yokes 22 allows one of each of the pairs of the suspension cables 28 of each of the suspension units 18 to stably support luminaire 12. The length of suspension cables 28 is adjusted using the mechanism of cable grippers 26 until any remaining length discrepancy between each pair of suspension cables 28 can be overcome with the range of motion of yoke 22 of each suspension unit 18 (i.e., vertical displacement 54 shown in Figure 4). Then, free rotation of yoke 22 of each suspension unit 18 about its pivot axis will evenly balance tension between the pairs of suspension cables 28 in each of yokes 22 to remove any slack and provide tautness for each suspension cable 28 of luminaire system 10.

[0033] Where a component (e.g. cable wire, projection, etc.) is referred to above, unless otherwise indicated, reference to that component (including a reference to a "means") should be interpreted as including as equivalents of that component any component which performs the function of the described component (i.e. that is functionally equivalent), including components which are not structurally equivalent to the disclosed structure which performs the function in the illustrated exemplary embodiments of the invention.

Claims

1. A luminaire mounting and suspension assembly (14) comprising:

a mounting unit (16);
a plurality of suspension units (18),
characterized in that
each suspension unit (18) comprises:

a housing (20) coupled to the mounting unit (16); and
a yoke (22) pivotally coupled to the housing (20) at a pivot point (24) so as to be pivotal about a pivot axis, the yoke (22) comprising a pair of cable grippers (26), each cable gripper (26) positioned on opposing sides of each pivot point (24) and configured to grip a suspension cable (28) for suspending a luminaire (12);

wherein the pivot axis is perpendicular to axes

- of the suspension cables (28); and
whereby free rotation of the yoke (22) about the
pivot axis evenly balances tension between the
suspension cables (28).
2. An assembly (14) according to claim 1 wherein the
housing (20) comprises a pair of stops (30) for lim-
iting the range of rotation of the yoke (22) about the
pivot axis.
 3. An assembly (14) according to claim 2 wherein the
yoke (22) comprises a yoke plate (32) with opposing
end portions (34), and each sidewall (36) of the hous-
ing (20) comprises a shoulder defining the stop (30),
whereby engagement of one of the end portions (34)
with a corresponding one of the stops (30) defines
a limit of the range of rotation of the yoke (22).
 4. An assembly (14) according to claim 3 wherein the
range of rotation of the yoke (22) is limited to no
greater than approximately 20 degrees, or approxi-
mately 15 degrees, or approximately 10 degrees.
 5. An assembly (14) according to claim 4 wherein the
cable grippers (26) are fixedly coupled to the yoke
plate (32).
 6. An assembly (14) according to claim 5 wherein the
cable grippers (26) are aligned along a plane per-
pendicular to the pivot axis.
 7. An assembly (14) according to claim 6 wherein the
yoke plate (32) comprises a pair of opposing flanged
yoke portions (38) extending perpendicularly from
the yoke plate (32), wherein the housing (20) com-
prises a housing plate (40) and a pair of opposing
flanged housing portions (42) extending perpendic-
ularly from the housing plate (40), and wherein the
pivot point includes a pivot pin (56) rotatably coupling
the flanged yoke portions (38) and flanged housing
portions (42).
 8. An assembly (14) according to claim 7 wherein the
yoke (22) is positioned on top of the housing (20),
whereby the yoke (22) is acted on by compression
forces due to the load of the luminaire (12).
 9. An assembly (14) according to claim 8 wherein the
housing plate (40) comprises a pair of apertures (44)
through which the cable grippers (26) and/or sus-
pension cables (28) extend, the apertures (44) di-
mensioned to accommodate lateral movement of the
cable grippers (26) and/or suspension cables (28)
due to the free rotation of the yoke (22).
 10. An assembly (14) according to claim 7 wherein the
yoke (22) is positioned below the housing (20),
whereby the yoke (22) is acted on by tension forces
- due to the load of the luminaire (12).
11. An assembly (14) according to claim 1 wherein hous-
ing (20) is pivotally or fixedly coupled to the mounting
unit (16).
 12. An assembly (14) according to claim 1 wherein the
suspension units (18) are evenly arranged about the
mounting unit (16).
 13. An assembly (14) according to claim 1 further com-
prising a pair of power wires (46), each power wire
(46) extending from the mounting unit (16) to a re-
spective one of the cable grippers (26) and connect-
ing to a respective one of the suspension cables (28).
 14. A luminaire system (10) comprising:

a mounting and suspension assembly (14) ac-
cording to any one of claims 1 to 13; and
a luminaire (12) suspended by the assembly
(14).
 15. A method of suspending a luminaire (12) comprising:

(a) providing and suspending a luminaire sys-
tem (10) according to claim 14;
(b) allowing the limitation of the range of motion
of the yoke (22) of each of the suspension units
(18) to support the luminaire (12) by one of the
suspension cables (28) of each of the suspen-
sion units (18);
(c) adjusting length of the suspension cables
(28) with the cable grippers (26) until any re-
maining length discrepancy between each pair
of the suspension cables (28) can be overcome
with the range of motion of the yoke (22) of each
suspension unit (18); and
(d) allowing free rotation of the yoke (22) of each
suspension unit (18) about the pivot axis to
evenly balance tension between the pairs of sus-
pension cables (28) in each of the yokes (22).

Patentansprüche

1. Leuchtenmontage- und -aufhängungsanordnung
(14), umfassend:

eine Montageeinheit (16);
mehrere Aufhängungseinheiten (18),
dadurch gekennzeichnet, dass
jede Aufhängungseinheit (18) umfasst:

ein Gehäuse (20), das mit der Montageein-
heit (16) gekoppelt ist; und
einen Bügel (22), der an einem Schwenk-
punkt (24) schwenkbar mit dem Gehäuse

- (20) gekoppelt ist, so dass er um eine Schwenkachse schwenkbar ist, wobei der Bügel (22) ein Paar Kabelgreifer (26) umfasst, wobei jeder Kabelgreifer (26) auf gegenüberliegenden Seiten jedes Schwenkpunkts (24) positioniert und eingerichtet ist, um ein Aufhängungskabel (28) zum Aufhängen einer Leuchte (12) zu greifen; wobei die Schwenkachse senkrecht zu Achsen der Aufhängungsseile (28) ist; und wodurch eine freie Drehung des Bügels (22) um die Schwenkachse eine Spannung zwischen den Aufhängungskabeln (28) gleichmäßig ausgleicht.
2. Anordnung (14) nach Anspruch 1, wobei das Gehäuse (20) ein Paar Anschläge (30) zum Begrenzen des Drehbereichs des Bügels (22) um die Schwenkachse umfasst.
 3. Anordnung (14) nach Anspruch 2, wobei der Bügel (22) eine Bügelplatte (32) mit gegenüberliegenden Endabschnitten (34) umfasst und jede Seitenwand (36) des Gehäuses (20) eine Schulter umfasst, die den Anschlag (30) definiert, wodurch ein Eingriff von einem der Endabschnitte (34) mit einem entsprechenden der Anschläge (30) eine Grenze des Drehbereichs des Bügels (22) definiert.
 4. Anordnung (14) nach Anspruch 3, wobei der Drehbereich des Bügels (22) auf nicht mehr als ungefähr 20 Grad oder ungefähr 15 Grad oder ungefähr 10 Grad begrenzt ist.
 5. Anordnung (14) nach Anspruch 4, wobei die Kabelgreifer (26) fest mit der Bügelplatte (32) gekoppelt sind.
 6. Anordnung (14) nach Anspruch 5, wobei die Kabelgreifer (26) entlang einer Ebene senkrecht zu der Schwenkachse ausgerichtet sind.
 7. Anordnung (14) nach Anspruch 6, wobei die Bügelplatte (32) ein Paar gegenüberliegender geflanschter Bügelabschnitte (38) umfasst, die sich senkrecht von der Bügelplatte (32) erstrecken, wobei das Gehäuse (20) eine Gehäuseplatte (40) und ein Paar gegenüberliegender geflanschter Gehäuseabschnitte (42) umfasst, die sich senkrecht von der Gehäuseplatte (40) erstrecken, und wobei der Schwenkpunkt einen Schwenkstift (56) aufweist, der die geflanschten Bügelabschnitte (38) und die geflanschten Gehäuseabschnitte (42) drehbar koppelt.
 8. Anordnung (14) nach Anspruch 7, wobei der Bügel (22) oben auf dem Gehäuse (20) positioniert ist, wodurch auf den Bügel (22) Druckkräfte aufgrund der Last der Leuchte (12) einwirken.
 9. Anordnung (14) nach Anspruch 8, wobei die Gehäuseplatte (40) ein Paar Öffnungen (44) umfasst, durch die sich die Kabelgreifer (26) und/oder Aufhängungskabel (28) erstrecken, wobei die Öffnungen (44) so bemessen sind, dass sie eine seitliche Bewegung der Kabelgreifer (26) und/oder Aufhängungskabel (28) aufgrund der freien Drehung des Bügels (22) aufnehmen.
 10. Anordnung (14) nach Anspruch 7, wobei der Bügel (22) unterhalb des Gehäuses (20) positioniert ist, wodurch auf den Bügel (22) Zugkräfte aufgrund der Last der Leuchte (12) einwirken.
 11. Anordnung (14) nach Anspruch 1, wobei das Gehäuse (20) schwenkbar oder fest mit der Montageeinheit (16) gekoppelt ist.
 12. Anordnung (14) nach Anspruch 1, wobei die Aufhängeeinheiten (18) gleichmäßig um die Montageeinheit (16) angeordnet sind.
 13. Anordnung (14) nach Anspruch 1, ferner umfassend ein Paar Stromkabel (46), wobei sich jedes Stromkabel (46) von der Montageeinheit (16) zu einem jeweiligen der Kabelgreifer (26) erstreckt und mit einem jeweiligen der Aufhängungskabel (28) verbunden ist.
 14. Leuchtensystem (10), umfassend:
 - eine Montage- und Aufhängeanordnung (14) nach einem der Ansprüche 1 bis 13; und
 - eine Leuchte (12), die von der Anordnung (14) aufgehängt ist.
 15. Verfahren zum Aufhängen einer Leuchte (12), umfassend:
 - (a) Bereitstellen und Aufhängen eines Leuchtensystems (10) nach Anspruch 14;
 - (b) Ermöglichen der Begrenzung des Bewegungsbereichs des Bügels (22) jeder der Aufhängeeinheiten (18), um die Leuchte (12) durch eines der Aufhängungskabel (28) jeder der Aufhängeeinheiten (18) zu tragen;
 - (c) Einstellen einer Länge der Aufhängungskabel (28) mit den Kabelgreifern (26), bis jede verbleibende Längendifferenz zwischen jedem Paar Aufhängungskabeln (28) mit dem Bewegungsbereich des Bügels (22) jeder Aufhängeeinheit (18) überwunden werden kann; und
 - (d) Ermöglichen einer freien Drehung des Bügels (22) jeder Aufhängeeinheit (18) um die Schwenkachse, um eine Spannung zwischen den Paaren Aufhängungskabeln (28) in jedem der Bügel (22) gleichmäßig auszugleichen.

Revendications

1. Ensemble de montage et de suspension de luminaire (14) comprenant :
 - une unité de montage (16) ;
 - une pluralité d'unités de suspension (18),
caractérisé en ce que
 chaque unité de suspension (18) comprend :
 - un boîtier (20) couplé à l'unité de montage (16) ; et
 - un étrier (22) couplé de manière pivotante au boîtier (20) à un point de pivotement (24) de manière à pivoter autour d'un axe de pivotement, l'étrier (22) comprenant une paire de serre-câbles (26), chaque serre-câble (26) étant positionné sur des côtés opposés de chaque point de pivotement (24) et configuré pour serrer un câble de suspension (28) destiné à suspendre un luminaire (12) ; dans lequel l'axe de pivotement est perpendiculaire aux axes des câbles de suspension (28) ; et
 - dans lequel la libre rotation de l'étrier (22) autour de l'axe de pivotement équilibre la tension entre les câbles de suspension (28).
2. Ensemble (14) selon la revendication 1, dans lequel le boîtier (20) comprend une paire de butées (30) pour limiter la plage de rotation de l'étrier (22) autour de l'axe de pivotement.
3. Ensemble (14) selon la revendication 2, dans lequel l'étrier (22) comprend une plaque d'étrier (32) avec des parties d'extrémité opposées (34), et chaque paroi latérale (36) du boîtier (20) comprend un épaulement définissant la butée (30), de sorte que l'engagement de l'une des parties d'extrémité (34) avec une butée (30) correspondante définit une limite de la plage de rotation de l'étrier (22).
4. Ensemble (14) selon la revendication 3, dans lequel la plage de rotation de l'étrier (22) est limitée à un maximum d'environ 20 degrés, ou d'environ 15 degrés, ou d'environ 10 degrés.
5. Ensemble (14) selon la revendication 4, dans lequel les serre-câbles (26) sont couplés de manière fixe à la plaque d'étrier (32) .
6. Ensemble (14) selon la revendication 5, dans lequel les serre-câbles (26) sont alignés le long d'un plan perpendiculaire à l'axe de pivotement.
7. Ensemble (14) selon la revendication 6, dans lequel la plaque d'étrier (32) comprend une paire de parties d'étrier à bride opposées (38) s'étendant perpendiculairement à partir de la plaque d'étrier (32), dans lequel le boîtier (20) comprend une plaque de boîtier (40) et une paire de parties de boîtier à bride opposées (42) s'étendant perpendiculairement à partir de la plaque de boîtier (40), et dans lequel le point de pivotement inclut un tourillon (56) couplant de manière rotative les parties d'étrier à bride (38) et les parties de boîtier à bride (42).
8. Ensemble (14) selon la revendication 7, dans lequel l'étrier (22) est positionné au-dessus du boîtier (20), de sorte que l'étrier (22) est soumis à des forces de compression dues à la charge du luminaire (12).
9. Ensemble (14) selon la revendication 8, dans lequel la plaque de boîtier (40) comprend une paire d'ouvertures (44) à travers lesquelles les serre-câbles (26) et/ou les câbles de suspension (28) s'étendent, les ouvertures (44) étant dimensionnées pour recevoir le mouvement latéral des serre-câbles (26) et/ou des câbles de suspension (28) dû à la libre rotation de l'étrier (22).
10. Ensemble (14) selon la revendication 7, dans lequel l'étrier (22) est positionné sous le boîtier (20), de sorte que l'étrier (22) est soumis à des forces de tension dues à la charge du luminaire (12).
11. Ensemble (14) selon la revendication 1, dans lequel le boîtier (20) est couplé de manière pivotante ou fixe à l'unité de montage (16).
12. Ensemble (14) selon la revendication 1, dans lequel les unités de suspension (18) sont disposées de manière uniforme autour de l'unité de montage (16).
13. Ensemble (14) selon la revendication 1, comprenant en outre une paire de fils d'alimentation (46), chaque fil d'alimentation (46) s'étendant de l'unité de montage (16) à l'un des serre-câbles (26) et se connectant à l'un des câbles de suspension (28).
14. Système de luminaire (10) comprenant :
 - un ensemble de montage et de suspension (14) selon l'une quelconque des revendications 1 à 13 ; et
 - un luminaire (12) suspendu par l'ensemble (14).
15. Procédé de suspension d'un luminaire (12), consistant à :
 - (a) fournir et suspendre un système de luminaire (10) selon la revendication 14 ;
 - (b) permettre la limitation de la plage de mouvement de l'étrier (22) de chacune des unités de suspension (18) pour supporter le luminaire (12) par l'un des câbles de suspension (28) de

chacune des unités de suspension (18) ;
(c) ajuster la longueur des câbles de suspension (28) avec les serre-câbles (26) jusqu'à ce que toute différence de longueur restante entre chaque paire de câbles de suspension (28) puisse être surmontée avec la plage de mouvement de l'étrier (22) de chaque unité de suspension (18) ;
et
(d) permettre la libre rotation de l'étrier (22) de chaque unité de suspension (18) autour de l'axe de pivotement afin d'équilibrer la tension entre les paires de câbles de suspension (28) dans chacun des étriers (22).

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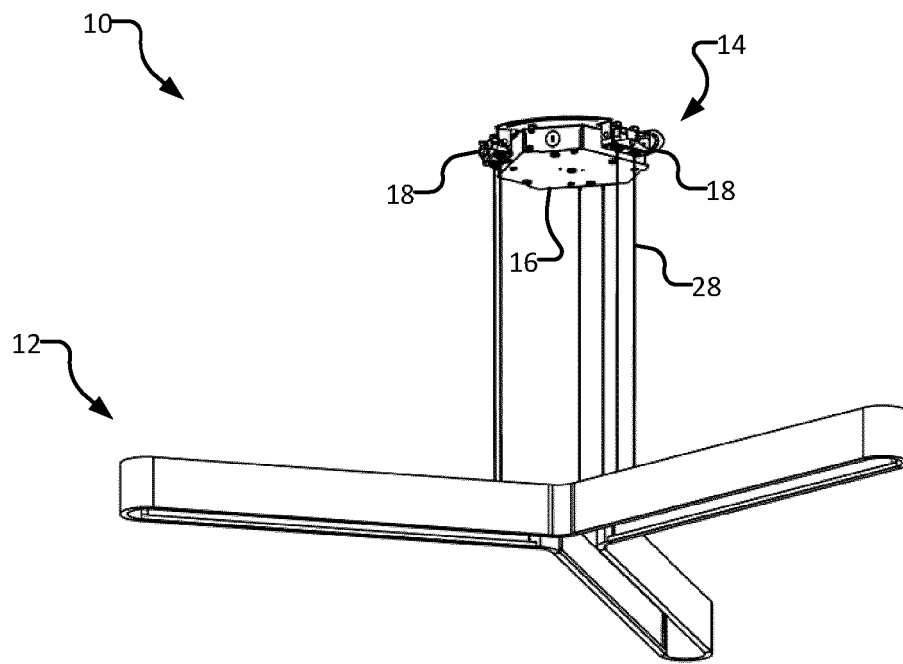


FIG. 1

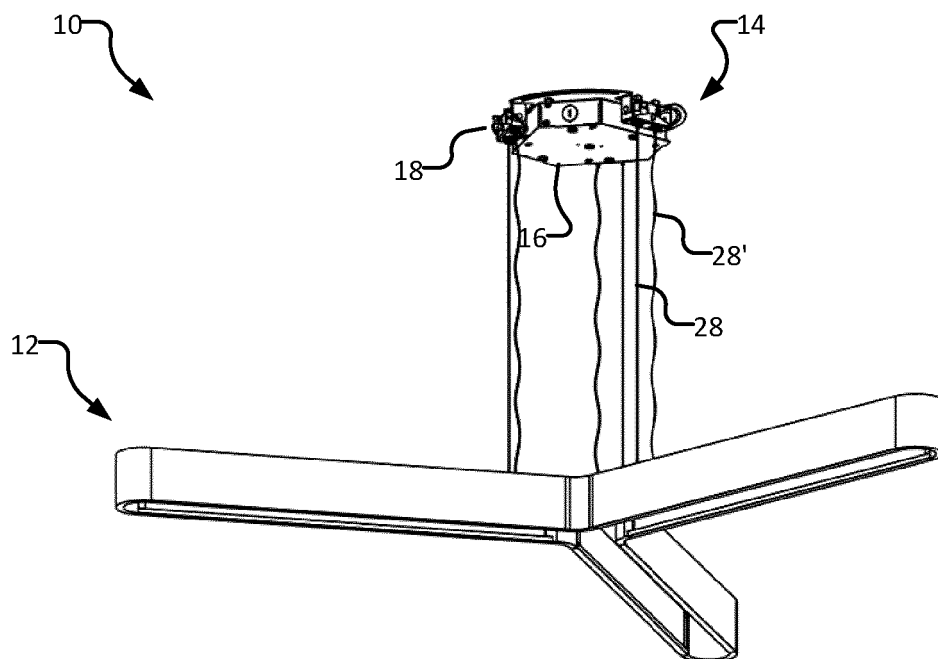


FIG. 2

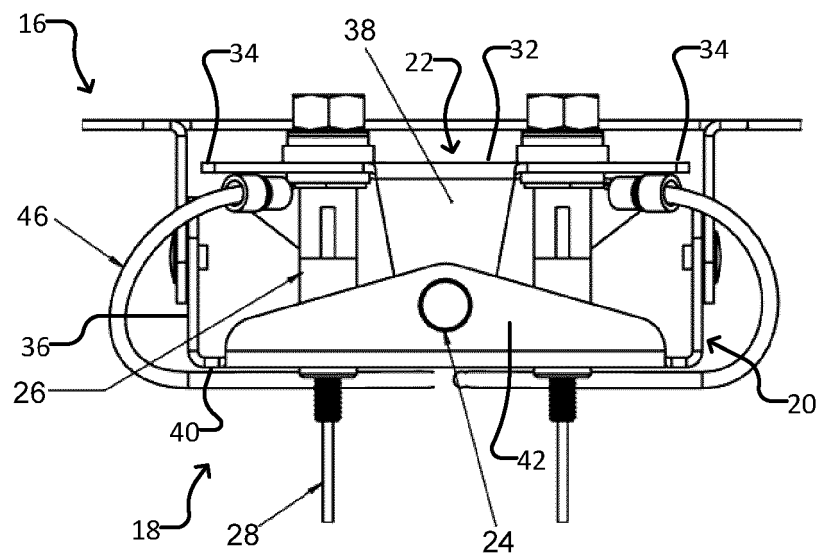


FIG. 3

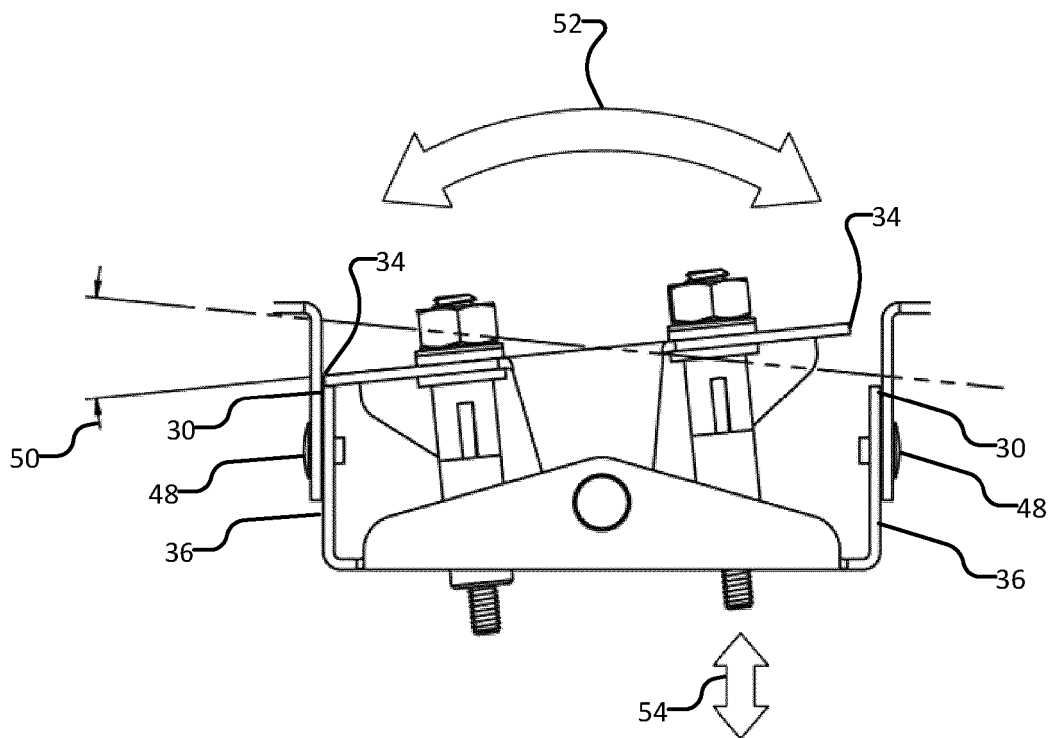


FIG. 4

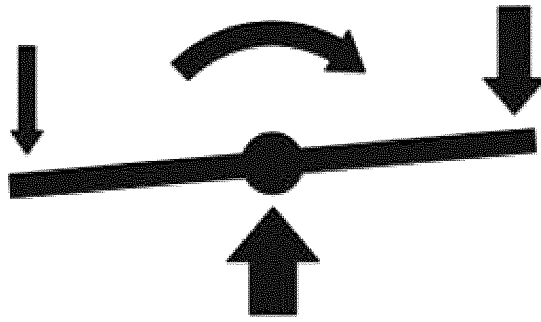


FIG. 5

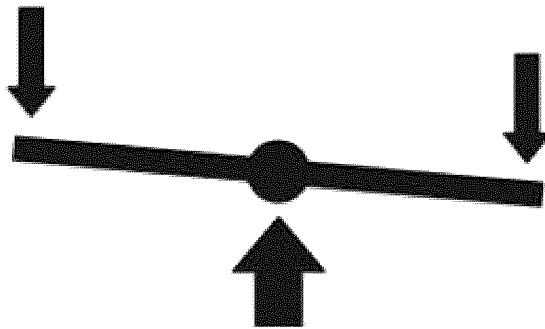


FIG. 6

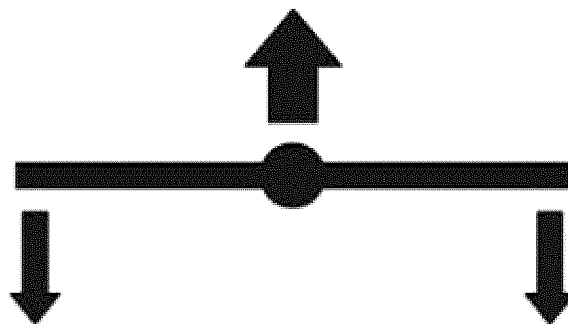


FIG. 7

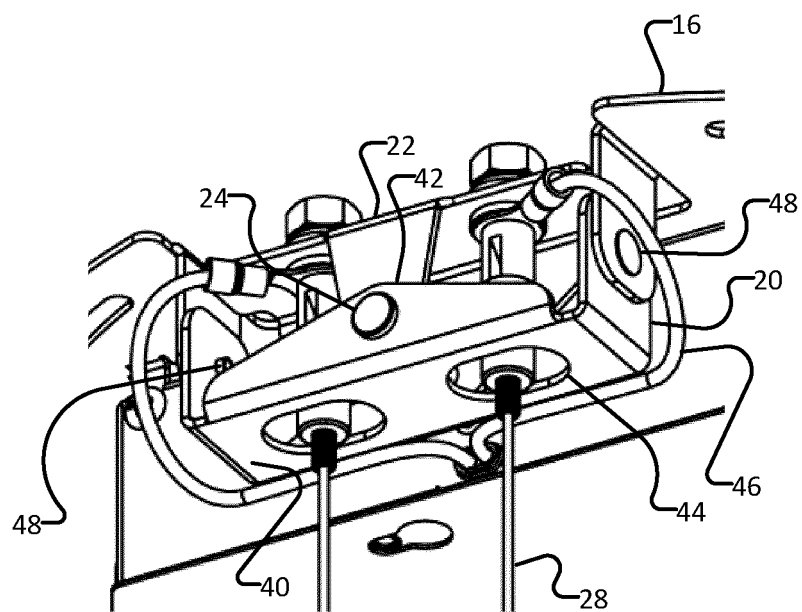


FIG. 8

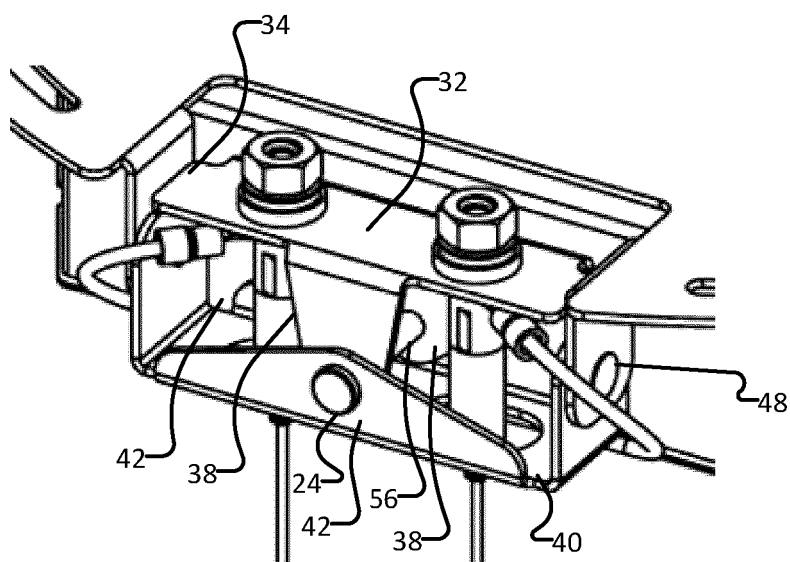


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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